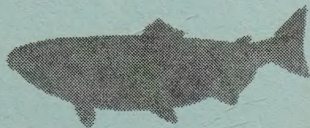
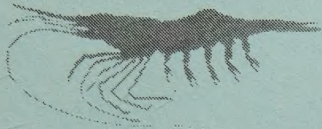


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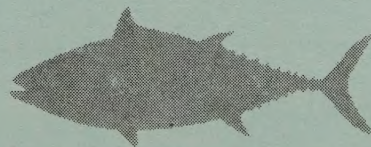
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AN ESTIMATE OF HARBOR PORPOISE MORTALITIES IN CALIFORNIA SET NET FISHERIES, APRIL 1, 1985 THROUGH MARCH 31, 1986

Doyle A. Hanan, Sandra L. Diamond, and John P. Scholl



March 1987

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in California Set Net Fisheries,
April 1, 1985 through March 31, 1986

by

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INTRODUCTION

The numbers of harbor porpoise caught in the set net fisheries off central California have been estimated at approximately 303 ± 93 (SE) in 1983-84 and 226 ± 54 (SE) in 1984-85. This study was contracted to California Department of Fish and Game by National Marine Fisheries Service, Southwest Region, to estimate the number of harbor porpoise accidentally killed or taken during the 1985-86 fishing year for comparison to the 1983-84 and 1984-85 estimates. The period covered by this study was April 1, 1985 to March 31, 1986 and a bootstrap technique was used to calculate the estimate.

METHODS OF OBSERVATION

For the 1985-86 fishing season, samples were obtained 1) with observers aboard the fishing vessels, 2) from a skiff alongside the fishing vessels, or 3) from shore using high powered telescopes. In the San Francisco area, all observations were made with the observer aboard the fishing vessel for an entire fishing trip. In the Monterey Bay area, one observation was made by shore-based telescope, and the rest were made from a skiff pulled alongside the fishing vessels. The lack of cooperation experienced by the observers in the Morro Bay area in 1983-84 and 1984-85 was again a problem in 1985-86 and required most of the Morro Bay observations to be made by shore-based telescopes.

In each area, there were instances of observations with only part of a net observed. These partial observations were especially common during telescopic observations when sun glare was a problem or when the fishing vessel's position (relative to the observer) caused extremely variable sighting conditions. The partial observations were treated as percentages of net observed and used in the analysis.

ESTIMATES OF TOTAL EFFORT

A unit of effort was defined as one net deployed to fish and then retrieved (a set). Total fishing effort was the number of sets during the fishing year and was calculated from three data sources: fishing logs, used as the primary data base; landing receipts; and observations of fishing activities. Total effort was calculated as in Hanan et al. (1986).

ESTIMATES OF HARBOR PORPOISE CAUGHT

Contagion or Clustering of Harbor Porpoise Take

Chi-square tests were used to examine observed porpoise kills for contagion or clustering due to fishing parameters (i.e., season, fishing location, water depth, net length, net type, net material, observation type, and soak time). To estimate mortality, fishing effort and observed porpoise kill were stratified by those fishing parameters that significantly clustered the observed kills.

Calculations of Total Kill

For the 1983-84 and 1984-85 harbor porpoise mortality estimates, three separate methods (straight ratio, Poisson, and bootstrap) were used to estimate the harbor porpoise take (Diamond and Hanan 1986; Hanan et al. 1986). Each method calculated a subtotal by area and then the subtotals were combined to obtain the total take of harbor porpoise in California waters. Because of similarities in the estimation methods and results, we have chosen to use only the bootstrap method for mortality estimates in this paper.

RESULTS

San Francisco Area

The San Francisco area was divided into three subareas (Bodega Bay, San Francisco, and Halfmoon Bay). Chi-square analysis showed that the incidental take of harbor porpoise was clustered by subarea ($P < 0.001$), season ($P < 0.001$), and soak time ($P < 0.001$). Take was significantly higher in the Bodega Bay subarea (Fish and Game blocks 422-439, Appendices I and II), in the spring (March, April, and May), and at soak times greater than 48 hours. Because of the clustering of porpoise kill by these fishing parameters, two estimates of mortality were made: one an unstratified estimate and another stratified by subarea, season, and soak time.

Fishing effort was calculated to be 3007 ± 217 (SE) sets (Table 1). Approximately 11.6% of the reported fleet effort was observed (Table 2). When total effort was applied to the observed mortality rate, an unstratified mortality estimate of 243 porpoise was obtained with a 95% confidence level of 127 to 359 porpoise (Table 3). The stratified mortality estimate was 134 porpoise with a 95% confidence level of 68 to 200 porpoise (Table 3).

Monterey Bay Area

The take of porpoise was proportional to sampling effort for the fishing parameters examined with approximately 3.9% of the effort sampled (Table 2). When total effort (1255 ± 120 sets) was applied to the mortality rate, a kill estimate of 55 porpoise was obtained with a 95% confidence level of 0 to 129 porpoise (Tables 1 and 3).

Morro Bay Area

The take of porpoise was proportional to sampling effort for all parameters discernible by telescope with approximately 9.2% of the effort sampled (Table 2). When total effort (3464 ± 337 sets) was applied to the mortality rate, a kill estimate of 37 porpoise was obtained with a 95% confidence level of 1 to 73 porpoise (Tables 1 and 3).

California Total

Total effort during the fishing year was approximately 7,726 ± 418 sets. The unstratified mortality estimate was 334 porpoise with a 95% confidence level of 198 to 472 porpoise (Table 3). The total porpoise mortality with the Bodega Bay subarea stratified by season and soak time was 226 porpoise with a 95% confidence level of 120 to 332 porpoise (Table 3).

SUMMARY and DISCUSSION

The estimate of 226 ± 53 SE harbor porpoise killed in fishing operations for the 1985-86 fishing year is nearly the same result as for the previous year (226 ± 54 SE; Hanan et. al. 1986), and lower than the estimate for 1983-84 (303 ± 93 SE; Diamond and Hanan, 1986); although, effort declined well below the previous two years (9,122 in 1983-84; 9,838 in 1984-5; and 7,726 in 1985-86) and the percentage of fleet effort observed increased each year respectively (5.1%, 8.1%, and 9.2%). The total number of observed kills also increased with each sampling year respectively (14, 19, and 33), but this increase does not seem to

parallel the increased observation rate. The combination of reduced fishing effort during 1985-86 and increased mortality rate accounts for an estimate which is virtually the same as the previous year.

An additional component that was considered and does have bearing is the set net fishery for croaker. DFG has observed about 200 net pulls in this fishery since 1980; during those years only one harbor porpoise was observed caught and that was in the 1985-86 fishing year. Because of this low likelihood of catch, we did not include the croaker fishery in our estimate for harbor porpoise mortality; however, the estimate for 1985-86 should be increased by at least the one porpoise.

This paper represents the collation of data gathered by the cooperative efforts of five DFG research projects. There is a great deal of variation in the collection methods for the field observations and a great deal of variation in the data used for the effort calculations. For these reasons and others expressed in Diamond and Hanan (1986), the relatively small error component is possibly misleading, but this mortality estimate is the best that can be achieved based on the available data.

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REFERENCES CITED

- Diamond S. L., and D. A. Hanan. 1986. An estimate of Harbor Porpoise Mortality in California Set Net Fisheries, April 1, 1983 through March 31, 1984. NMFS Southwest Region, Admin. Rep. SWR-86-15.
- Hanan, D. A., S. L. Diamond, and J. P. Scholl. 1986. An estimate of Harbor Porpoise Mortality in California Set Net Fisheries, April 1, 1984 through March 31, 1985. NMFS Southwest Region, Admin. Rep. SWR-86-16.

TABLE 1. Estimates of total effort by area (SF= San Francisco, MntB= Monterey Bay, MB= Morro Bay) based on fishing logs, landing receipts, and DFG observations during April 1, 1985 to March 31, 1986.

AREA	LOGGED DAYS	UNLOGGED DAYS	TOTAL DAYS	#SETS/ DAY ($\pm$ SE)	TOTAL EFFORT ($\pm$ SE)
SF	1,050	224	1,274	2.36 $\pm$.17	3,007 $\pm$ 217
MntB	348	133	481	2.61 $\pm$.25	1,255 $\pm$ 120
MB	954	99	1,053	3.29 $\pm$.32	3,464 $\pm$ 337
TOTAL					----- 7,726 $\pm$ 418

TABLE 2. DFG sampling effort by area for April 1, 1985 to March 31, 1986. The number of samples represents the sum of observed nets (including fractions of partially observed nets) rounded to the nearest integer.

AREA	#SAMPLES	#HARBOR PORPOISE CAUGHT	%EFFORT OBSERVED
San Francisco	348	28	11.6%
Monterey Bay	49	2	3.9%
Morro Bay	317	3	9.2%
TOTAL	714	33	9.2%

TABLE 3. Estimates of harbor porpoise killed by set net in California waters during April 1, 1985 to March 31, 1986 with the Bodega Bay subarea stratified by season and soak time.

	EFFORT (SETS)	KILL ESTIMATES +SE	
		STRATIFIED	UNSTRATIFIED

SAN FRANCISCO AREA			
Bodega Bay Subarea			
spring (March-May)			
<48 hrs	175	31 +22	
range		0-74	
>48 hrs	42	40 +12	
range		15-64	
rest of year			
<48 hrs	736	22 +13	
range		0-48	
>48 hrs	39	6 +4	
range		0-14	
Remainder of			
San Francisco Area	2,015	35 +18	
95% CI RANGE		0-71	
SAN FRANCISCO AREA			
SUBTOTAL	3,007	134 +33	243 +58
95% CI RANGE		68-200	127-359

MONTEREY BAY AREA	1,255	55 +37	57 +40
95% CI RANGE		0-129	0-137

MORRO BAY AREA	3,464	37 +18	35 +22
95% CI RANGE		1-73	0-79
=====			
	SETS	STRATIFIED	UNSTRATIFIED
CALIFORNIA TOTALS	7,726	226 +53	335 +70
95% CI RANGE		120-332	195-475

